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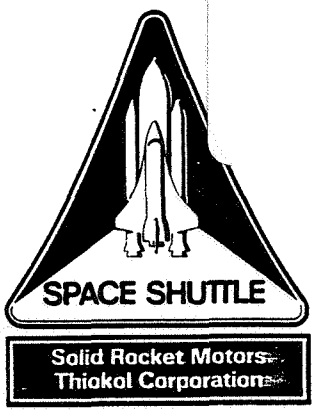

Appendix D
Nozzle Postfire Data

Final Postflight Hardware Evaluation Report 360T025 (RSRM-25, STS-46)

March 1993

Prepared for

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George C. Marshall Space Flight Center
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APPENDIX D
NOZZLE POSTFIRE DATA

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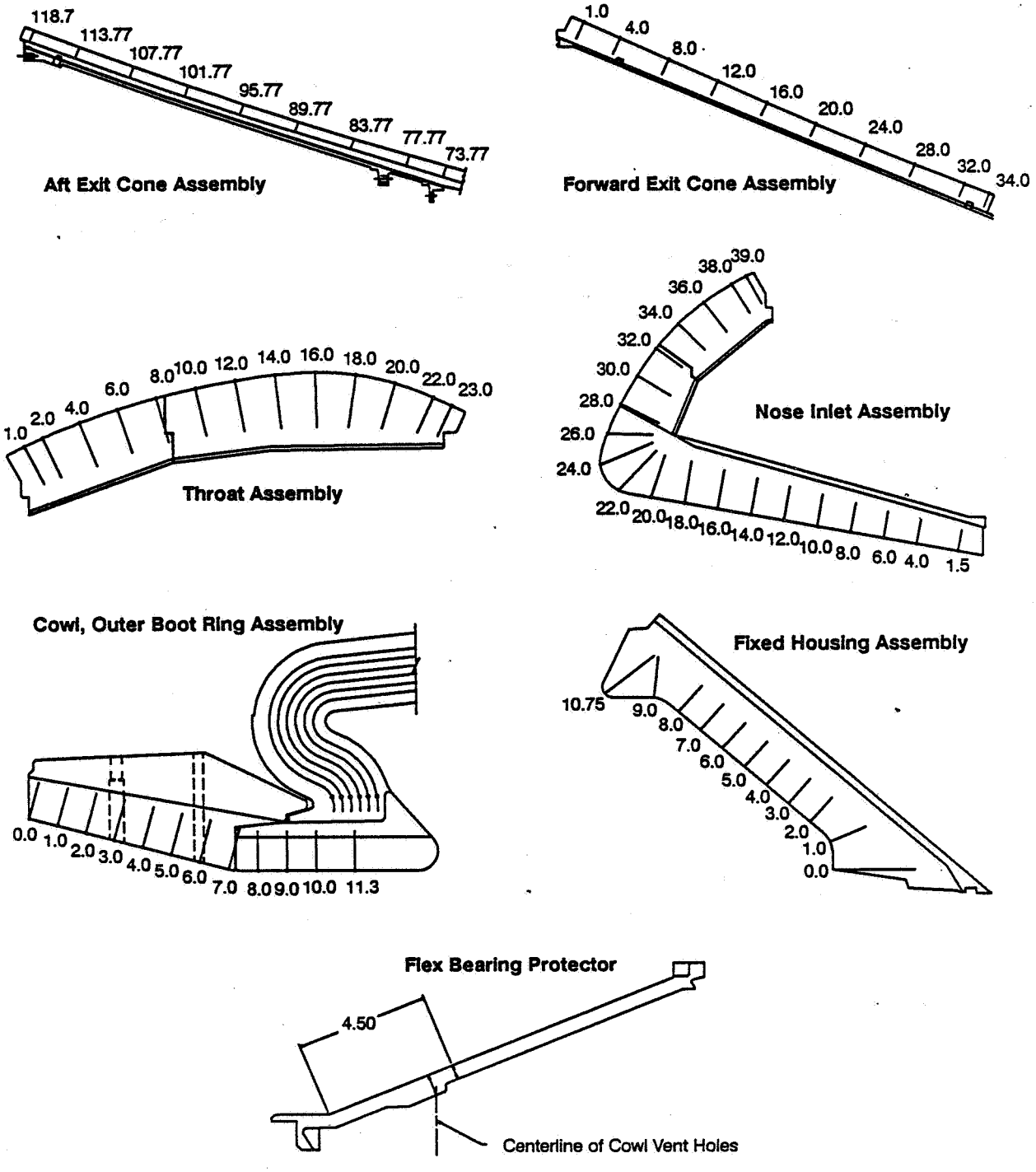

Figure D–1. RSRM Nozzle Liner Char and Erosion Station Locations

Table D-I. 360T025A Forward Exit Cone Assembly Char and Erosion Data

Angular Location	Stations		
0 degrees	1.0	4.0	4.6
Measured Erosion	0.32		
Measured Char	0.73		
Adjusted Char *	0.58		
Denomenator	1.27		
RSRM Liner Thickness	1.807	1.731	1.411
Margin of Safety	0.42		
90 degrees			
Measured Erosion	0.40		
Measured Char	0.72		
Adjusted Char *	0.58		
Denomenator	1.40		
RSRM Liner Thickness	1.807	1.731	1.411
Margin of Safety	0.29		
180 degrees			
Measured Erosion	0.29		
Measured Char	0.77		
Adjusted Char *	0.62		
Denomenator	1.26		
RSRM Liner Thickness	1.807	1.731	1.411
Margin of Safety	0.43		
270 degrees			
Measured Erosion	0.39	0.40	0.39
Measured Char	0.71	0.68	0.70
Adjusted Char *	0.57	0.54	0.56
Denomenator	1.37	1.36	1.15
RSRM Liner Thickness	1.807	1.731	1.411
Margin of Safety	0.32	0.27	0.23

Minimum margin of safety is 0.23 at station 4.60 degree 270.00
Maximum margin of safety is 0.43 at station 1.00 degree 180.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{1.50 \times \text{erosion} + 1.00 \times \text{adj char}^{*}} - 1$$

Table D-II. 360T025B Forward Exit Cone Assembly Char and Erosion Data

Angular Location	Stations			
0 degrees	1.0	4.0	4.6	8.0
Measured Erosion	0.37	0.36	0.36	0.34
Measured Char	0.76	0.70	0.69	0.74
Adjusted Char *	0.61	0.56	0.55	0.59
Denomenator	1.39	1.31	1.09	1.32
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.30	0.32	0.29	0.24
90 degrees				
Measured Erosion	0.35	0.35	0.34	
Measured Char	0.83	0.73	0.71	
Adjusted Char *	0.66	0.58	0.57	
Denomenator	1.43	1.32	1.08	
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.27	0.31	0.31	
180 degrees				
Measured Erosion	0.35	0.38	0.36	0.30
Measured Char	0.75	0.73	0.69	0.78
Adjusted Char *	0.60	0.58	0.55	0.62
Denomenator	1.35	1.38	1.09	1.29
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.34	0.26	0.29	0.26
270 degrees				
Measured Erosion	0.37	0.36	0.37	0.33
Measured Char	0.79	0.74	0.73	0.73
Adjusted Char *	0.63	0.59	0.58	0.58
Denomenator	1.42	1.35	1.14	1.29
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.27	0.28	0.24	0.26

Minimum margin of safety is 0.24 at station 8.00 degree 0.00
Maximum margin of safety is 0.34 at station 1.00 degree 180.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{1.70 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table D-III. 360T025A Throat Assembly Char and Erosion Data

Angular Location	Stations												
0 degrees	1.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	23.0
Measured Erosion	1.06	1.07	1.13	1.19	1.24	1.18	1.15	1.12	1.07	1.10	0.65	0.40	0.36
Measured Char	0.44	0.55	0.63	0.58	0.42	0.44	0.47	0.49	0.50	0.57	0.64	0.75	0.79
Adjusted Char *	0.33	0.41	0.47	0.43	0.32	0.33	0.35	0.37	0.38	0.46	0.51	0.60	0.63
Denomenator	2.53	2.66	2.85	2.92	2.87	2.77	2.74	2.70	2.61	2.77	1.94	1.55	1.51
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.25	0.22	0.16	0.12	0.11	0.23	0.28	0.34	0.42	0.29	0.67	0.67	0.40
90 degrees													
Measured Erosion	1.00	1.03	1.07	1.13	1.19	1.17	1.14	1.10	1.08	0.88	0.67	0.44	0.36
Measured Char	0.50	0.55	0.61	0.59	0.54	0.53	0.48	0.53	0.57	0.65	0.69	0.79	0.85
Adjusted Char *	0.38	0.41	0.46	0.44	0.41	0.40	0.36	0.40	0.43	0.52	0.55	0.63	0.68
Denomenator	2.47	2.58	2.71	2.81	2.89	2.84	2.73	2.70	2.69	2.41	2.03	1.67	1.57
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.29	0.26	0.22	0.17	0.10	0.20	0.29	0.34	0.38	0.49	0.59	0.55	0.34
180 degrees													
Measured Erosion	0.99	1.02	1.06	1.13	1.14	1.10	1.10	1.09	1.06	0.91	0.70	0.44	0.37
Measured Char	0.61	0.55	0.58	0.54	0.53	0.45	0.43	0.53	0.56	0.58	0.63	0.78	0.78
Adjusted Char *	0.46	0.41	0.43	0.41	0.40	0.34	0.32	0.40	0.42	0.46	0.50	0.62	0.62
Denomenator	2.55	2.56	2.66	2.77	2.78	2.62	2.60	2.68	2.65	2.40	2.03	1.66	1.52
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.24	0.27	0.24	0.19	0.15	0.30	0.35	0.35	0.40	0.49	0.59	0.56	0.39
270 degrees													
Measured Erosion	1.05	1.05	1.10	1.16	1.20	1.16	1.12	1.11	1.08	0.95	0.73	0.50	0.44
Measured Char	0.58	0.55	0.58	0.57	0.52	0.47	0.48	0.52	0.56	0.60	0.64	0.72	0.76
Adjusted Char *	0.43	0.41	0.43	0.43	0.39	0.35	0.36	0.39	0.42	0.48	0.51	0.58	0.61
Denomenator	2.64	2.62	2.74	2.85	2.89	2.76	2.69	2.71	2.69	2.50	2.10	1.72	1.64
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.20	0.24	0.21	0.15	0.10	0.23	0.31	0.34	0.38	0.43	0.54	0.50	0.29

Minimum margin of safety is 0.10 at station 8.00 degree 270.00
Maximum margin of safety is 0.67 at station 22.00 degree 0.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{\text{2.00 X erosion + 1.25 X adj char *}} - 1$$

Table D-IV. 360T025B Throat Assembly Char and Erosion Data

Angular . .ation	Stations												
0 degrees	1.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	23.0
Measured Erosion	1.03	1.08	1.14	1.07	1.18	1.17	1.16	1.15	1.08	0.96	0.75	0.46	0.35
Measured Char	0.63	0.58	0.56	0.55	0.57	0.48	0.46	0.46	0.50	0.53	0.67	0.78	0.87
Adjusted Char *	0.47	0.43	0.42	0.41	0.43	0.36	0.35	0.35	0.38	0.42	0.54	0.62	0.70
Denomenator	2.65	2.70	2.80	2.66	2.89	2.79	2.75	2.73	2.63	2.45	2.17	1.70	1.57
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.20	0.20	0.18	0.24	0.10	0.22	0.28	0.33	0.41	0.46	0.49	0.52	0.34
90 degrees.													
Measured Erosion	1.06	1.10	1.17	1.20	1.21	1:21	1.20	1.17	1.08	0.90	0.70	0.38	0.32
Measured Char	0.59	0.62	0.57	0.54	0.52	0.47	0.47	0.49	0.55	0.57	0.61	0.78	0.78
Adjusted Char *	0.44	0.47	0.43	0.41	0.39	0.35	0.35	0.37	0.41	0.46	0.49	0.62	0.62
Denomenator	2.67	2.78	2.87	2.91	2.91	2.86	2.84	2.80	2.68	2.37	2.01	1.54	1.42
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.19	0.17	0.15	0.13	0.09	0.19	0.24	0.30	0.39	0.51	0.61	0.68	0.49
180 degrees													
Measured Erosion	1.07	1.13	1.17	1.20	1.22	1.17	1.19	1.16	1.05	0.92	0.70	0.43	0.37
Measured Char	0.64	0.62	0.60	0.57	0.54	0.56	0.55	0.58	0.54	0.47	0.64	0.75	0.78
Adjusted Char *	0.48	0.47	0.45	0.43	0.41	0.42	0.41	0.43	0.41	0.38	0.51	0.60	0.62
Denomenator	2.74	2.84	2.90	2.93	2.95	2.86	2.90	2.86	2.61	2.31	2.04	1.61	1.52
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.16	0.14	0.14	0.12	0.08	0.19	0.21	0.27	0.42	0.55	0.58	0.60	0.39
270 degrees													
Measured Erosion						1.20	1.20	1.21	1.14	1.02	0.80	0.52	0.49
Measured Char						0.48	0.49	0.51	0.51	0.58	0.61	0.79	0.77
Adjusted Char *						0.36	0.37	0.38	0.38	0.46	0.49	0.63	0.62
Denomenator						2.85	2.86	2.90	2.76	2.62	2.21	1.83	1.75
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety						0.19	0.23	0.25	0.35	0.37	0.46	0.41	0.21

Minimum margin of safety is 0.08 at station 8.00 degree 180.00
Maximum margin of safety is 0.68 at station 22.00 degree 90.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table D-V. 360T025A Nose Inlet rings (-503, -504) Char and Erosion Data

Angular Location	Stations						
0 degrees	28.0	30.0	32.0	34.0	36.0	38.0	39.0
Measured Erosion	1.15	0.85	0.86	0.81	0.92	0.98	0.99
Measured Char	0.61	0.68	0.54	0.43	0.49	0.52	0.60
Adjusted Char *	0.46	0.51	0.41	0.32	0.37	0.39	0.45
Denomenator	2.87	2.34	2.23	2.02	2.30	2.45	2.54
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.22	0.39	0.33	0.57	0.39	0.24	0.18
90 degrees							
Measured Erosion	1.05	0.82	0.90	0.85	0.90	0.99	1.03
Measured Char	0.71	0.68	0.63	0.49	0.52	0.57	0.60
Adjusted Char *	0.53	0.51	0.47	0.37	0.39	0.43	0.45
Denomenator	2.77	2.28	2.39	2.16	2.29	2.51	2.62
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.27	0.43	0.23	0.47	0.40	0.20	0.14
180 degrees							
Measured Erosion	0.97	0.77	0.85	0.79	0.84	0.91	0.92
Measured Char	0.65	0.68	0.57	0.49	0.51	0.55	0.50
Adjusted Char *	0.49	0.51	0.43	0.37	0.38	0.41	0.38
Denomenator	2.55	2.18	2.23	2.04	2.16	2.34	2.31
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.38	0.49	0.32	0.56	0.48	0.30	0.30
270 degrees							
Measured Erosion	1.04	0.86	0.92	0.88	0.89	0.99	0.99
Measured Char	0.73	0.64	0.58	0.47	0.53	0.53	0.59
Adjusted Char *	0.55	0.48	0.43	0.35	0.40	0.40	0.44
Denomenator	2.76	2.32	2.38	2.20	2.28	2.48	2.53
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.27	0.40	0.24	0.45	0.41	0.22	0.18

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table D-VI. 360T025B Nose Inlet rings (-503, -504) Char and Erosion Data

Angular Location	Stations						
0 degrees	28.0	30.0	32.0	34.0	36.0	38.0	39.0
Measured Erosion	0.98	0.81	0.94	0.83	0.81	0.91	0.92
Measured Char	0.79	0.68	0.55	0.55	0.57	0.58	0.57
Adjusted Char *	0.59	0.51	0.41	0.41	0.43	0.43	0.43
Denomenator	2.70	2.26	2.40	2.18	2.15	2.36	2.37
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.30	0.44	0.23	0.46	0.49	0.28	0.26
90 degrees							
Measured Erosion	1.04	0.83	0.89	0.86	0.87	0.91	0.95
Measured Char	0.78	0.70	0.63	0.53	0.54	0.59	0.61
Adjusted Char *	0.59	0.53	0.47	0.40	0.41	0.44	0.46
Denomenator	2.81	2.32	2.37	2.22	2.25	2.37	2.47
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.25	0.40	0.24	0.44	0.42	0.28	0.21
180 degrees							
Measured Erosion	1.06	0.90	0.94	0.86	0.90	0.90	0.92
Measured Char	0.77	0.68	0.59	0.49	0.47	0.57	0.62
Adjusted Char *	0.58	0.51	0.44	0.37	0.35	0.43	0.47
Denomenator	2.84	2.44	2.43	2.18	2.24	2.33	2.42
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.23	0.33	0.21	0.46	0.43	0.30	0.24
270 degrees							
Measured Erosion		0.88	0.91	0.85	0.87	0.94	0.97
Measured Char	1.80	0.72	0.60	0.53	0.53	0.52	0.60
Adjusted Char *	1.35	0.54	0.45	0.40	0.40	0.39	0.45
Denomenator		2.44	2.38	2.20	2.24	2.37	2.50
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety		0.34	0.24	0.45	0.43	0.28	0.20

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table D-VII. 360T025A Nose Cap Char and Erosion Data

Angular Location	Stations												
0 degrees	1.5	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0
Measured Erosion		0.32	0.39	0.48	0.48	0.56	0.52	0.79	0.89	1.05	1.75	1.95	1.45
Measured Char	0.79	0.55	0.57	0.54	0.54	0.42	0.54	0.46	0.43	0.43	0.76	0.74	0.82
Adjusted Char *	0.63	0.44	0.46	0.43	0.43	0.34	0.43	0.37	0.34	0.34	0.61	0.59	0.61
Denomenator		1.19	1.35	1.50	1.50	1.54	1.58	2.04	2.21	2.53	4.26	4.64	3.67
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.71	0.67	0.64	0.78	0.87	0.95	0.62	0.59	0.60	0.11	0.01	0.05
90 degrees													
Measured Erosion		0.35	0.33	0.39	0.43	0.45	0.50	0.58	0.66	0.84	1.34	1.54	1.06
Measured Char	0.81	0.54	0.56	0.52	0.50	0.45	0.48	0.46	0.46	0.41	0.58	0.63	0.67
Adjusted Char *	0.65	0.43	0.45	0.42	0.40	0.36	0.38	0.37	0.37	0.33	0.46	0.50	0.50
Denomenator		1.24	1.22	1.30	1.36	1.35	1.48	1.62	1.78	2.09	3.26	3.71	2.75
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.64	0.84	0.89	0.96	1.13	1.09	1.04	0.97	0.94	0.45	0.26	0.41
180 degrees													
Measured Erosion		0.27	0.31	0.36	0.38	0.43	0.43	0.58	0.60	0.79	1.24	1.51	1.05
Measured Char	0.83	0.59	0.59	0.56	0.60	0.48	0.47	0.45	0.44	0.37	0.65	0.63	0.68
Adjusted Char *	0.66	0.47	0.47	0.45	0.48	0.38	0.38	0.36	0.35	0.30	0.52	0.50	0.51
Denomenator		1.13	1.21	1.28	1.36	1.34	1.33	1.61	1.64	1.95	3.13	3.65	2.74
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.80	0.86	0.92	0.96	1.15	1.32	1.05	1.14	1.08	0.51	0.29	0.41
270 degrees													
Measured Erosion		0.32	0.38	0.46	0.52	0.55	0.58	0.71	0.78	0.96	1.50	1.67	1.17
Measured Char	0.89	0.67	0.59	0.49	0.53	0.43	0.48	0.40	0.34	0.37	0.55	0.65	0.63
Adjusted Char *	0.71	0.54	0.47	0.39	0.42	0.34	0.38	0.32	0.27	0.30	0.44	0.52	0.47
Denomenator		1.31	1.35	1.41	1.57	1.53	1.64	1.82	1.90	2.29	3.55	3.99	2.93
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.56	0.67	0.74	0.70	0.88	0.88	0.81	0.85	0.77	0.33	0.18	0.32

Minimum margin of safety is 0.01 at station 24.00 degree 0.00
Maximum margin of safety is 1.32 at station 14.00 degree 180.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table D-VIII. 360T025B Nose Cap Char and Erosion Data

Angular Location		Stations											
0 degrees	1.5	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0
Measured Erosion		0.36	0.36	0.41	0.42	0.54	0.55	0.63	0.69	0.85	1.25	1.49	1.09
Measured Char	0.92	0.54	0.57	0.54	0.53	0.49	0.50	0.43	0.41	0.45	0.69	0.78	0.67
Adjusted Char *	0.74	0.43	0.46	0.43	0.42	0.39	0.40	0.34	0.33	0.36	0.55	0.62	0.50
Denomenator		1.26	1.29	1.36	1.37	1.57	1.60	1.69	1.79	2.15	3.19	3.76	2.81
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.62	0.74	0.81	0.95	0.83	0.93	0.95	0.96	0.89	0.48	0.25	0.38
90 degrees													
Measured Erosion		0.35	0.39	0.49	0.51	0.59	0.63	0.72	0.81	1.02	1.53	1.67	1.16
Measured Char	0.77	0.56	0.54	0.46	0.53	0.44	0.41	0.41	0.41	0.36	0.63	0.70	0.81
Adjusted Char *	0.62	0.45	0.43	0.37	0.42	0.35	0.33	0.33	0.33	0.29	0.50	0.56	0.61
Denomenator		1.26	1.32	1.44	1.55	1.62	1.67	1.85	2.03	2.40	3.69	4.04	3.08
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.62	0.70	0.71	0.72	0.78	0.85	0.78	0.73	0.69	0.28	0.16	0.25
180 degrees													
Measured Erosion		0.33	0.38	0.45	0.47	0.59	0.60	0.69	0.81	0.98	1.52	1.71	1.19
Measured Char	0.84	0.56	0.55	0.56	0.52	0.45	0.44	0.37	0.41	0.39	0.62	0.79	0.81
Adjusted Char *	0.67	0.45	0.44	0.45	0.42	0.36	0.35	0.30	0.33	0.31	0.50	0.63	0.61
Denomenator		1.22	1.31	1.46	1.46	1.63	1.64	1.75	2.03	2.35	3.66	4.21	3.14
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.67	0.72	0.68	0.83	0.77	0.88	0.88	0.73	0.73	0.29	0.11	0.23
270 degrees													
Measured Erosion		0.36	0.40	0.47	0.52	0.59	0.65	0.73	0.83	1.03	1.54	1.71	1.16
Measured Char	0.91	0.57	0.56	0.53	0.51	0.47	0.44	0.46	0.44	0.38	0.65	0.66	0.76
Adjusted Char *	0.73	0.46	0.45	0.42	0.41	0.38	0.35	0.37	0.35	0.30	0.52	0.53	0.57
Denomenator		1.29	1.36	1.47	1.55	1.65	1.74	1.92	2.10	2.44	3.73	4.08	3.03
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety		0.58	0.65	0.67	0.72	0.74	0.77	0.72	0.67	0.66	0.26	0.15	0.27

Minimum margin of safety is 0.11 at station 24.00 degree 180.00
Maximum margin of safety is 0.96 at station 18.00 degree 0.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{\text{2.00 X erosion + 1.25 X adj char *}} - 1$$

Table D-IX. 360T025A Cowl/OBR Char and Erosion Data

Angular Location	Stations											
0 degrees	0.3	1.0	2.0	3.0	4.0	5.0	6.0	6.8	8.0	9.0	10.0	11.3
Measured Erosion		0.26	0.33	0.36	0.38	0.36	0.31		0.04	0.03	0.00	0.02
Measured Char	0.83	0.53	0.64	0.69	0.62	0.61	0.68	0.98	0.89	0.82	0.79	0.78
Adjusted Char *	0.66	0.42	0.51	0.55	0.50	0.49	0.54	0.78	0.71	0.66	0.63	0.62
Denomenator		1.05	1.30	1.41	1.38	1.33	1.28		1.13	1.03	0.95	0.97
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety		0.43	0.21	0.17	0.26	0.36	0.47		0.42	0.63	0.78	0.76
90 degrees												
Measured Erosion		0.27	0.30	0.31	0.28	0.27			0.04	0.04	0.00	0.02
Measured Char	0.87	0.58	0.64	0.62	0.62	0.64	1.00	1.05	0.96	0.85	0.88	0.83
Adjusted Char *	0.70	0.46	0.51	0.50	0.50	0.51	0.80	0.84	0.77	0.68	0.70	0.66
Denomenator		1.12	1.24	1.24	1.18	1.18			1.21	1.08	1.06	1.03
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety		0.34	0.27	0.33	0.47	0.53			0.32	0.55	0.60	0.66
180 degrees												
Measured Erosion	0.22	0.26	0.32	0.29	0.26	0.22	0.24	0.24	0.02	0.02	0.00	0.02
Measured Char	0.53	0.54	0.56	0.55	0.62	0.63	0.72	0.84	1.01	0.96	0.86	0.88
Adjusted Char *	0.42	0.43	0.45	0.44	0.50	0.50	0.58	0.67	0.81	0.77	0.69	0.70
Denomenator	0.97	1.06	1.20	1.13	1.14	1.07	1.22	1.37	1.24	1.18	1.03	1.09
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.48	0.41	0.31	0.46	0.52	0.69	0.54	0.42	0.29	0.42	0.63	0.57
270 degrees												
Measured Erosion	0.23	0.29	0.29	0.36	0.33	0.26	0.23		0.04	0.05	0.06	0.04
Measured Char	0.48	0.50	0.61	0.56	0.60	0.69	0.70		0.94	0.84	0.80	0.83
Adjusted Char *	0.38	0.40	0.49	0.45	0.48	0.55	0.56		0.75	0.67	0.64	0.66
Denomenator	0.94	1.08	1.19	1.28	1.26	1.21	1.19		1.19	1.08	1.05	1.06
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.53	0.39	0.33	0.29	0.38	0.50	0.59		0.35	0.55	0.61	0.61

Minimum margin of safety is 0.17 at station 3.00 degree 0.00
Maximum margin of safety is 0.78 at station 10.00 degree 0.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{1.50 \times \text{erosion} + 1.50 \times \text{adj char}^{*}} - 1$$

Table D-X. 360T025B Cowl/OBR Char and Erosion Data

Angular Location	Stations											
0 degrees	0.3	1.0	2.0	3.0	4.0	5.0	6.0	6.8	8.0	9.0	10.0	11.3
Measured Erosion	0.23	0.30	0.29	0.29	0.22	0.21	0.16		0.02	0.00	0.00	0.00
Measured Char	0.58	0.52	0.54	0.56	0.64	0.64	0.62		0.99	0.90	0.90	0.93
Adjusted Char *	0.46	0.42	0.43	0.45	0.51	0.51	0.50		0.79	0.72	0.72	0.74
Denomenator	1.04	1.12	1.12	1.14	1.08	1.06	0.98		1.22	1.08	1.08	1.12
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.38	0.34	0.41	0.45	0.60	0.71	0.92		0.31	0.55	0.56	0.53
90 degrees												
Measured Erosion	0.28	0.28	0.35	0.34	0.32	0.28	0.25		0.04	0.02	0.03	0.02
Measured Char	0.62	0.60	0.52	0.52	0.60	0.64	0.68	1.11	0.95	0.90	0.84	0.95
Adjusted Char *	0.50	0.48	0.42	0.42	0.48	0.51	0.54	0.89	0.76	0.72	0.67	0.76
Denomenator	1.18	1.16	1.22	1.20	1.24	1.20	1.19		1.20	1.11	1.05	1.17
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.22	0.29	0.29	0.38	0.40	0.51	0.59		0.33	0.51	0.60	0.46
180 degrees												
Measured Erosion	0.20	0.21	0.25	0.28	0.29				0.02	0.00	0.02	0.00
Measured Char	0.67	0.72	0.68	0.62	0.63	0.90	1.02		0.89	0.86	0.78	0.87
Adjusted Char *	0.54	0.58	0.54	0.50	0.50	0.72	0.82		0.71	0.69	0.62	0.70
Denomenator	1.07	1.14	1.18	1.18	1.21				1.10	1.03	0.97	1.04
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.34	0.31	0.34	0.40	0.43				0.46	0.62	0.75	0.63
270 degrees												
Measured Erosion		0.24	0.30	0.31	0.32					0.04	0.00	0.00
Measured Char	0.80	0.53	0.52	0.48	0.52	0.88	1.04		0.95	0.85	0.91	0.92
Adjusted Char *	0.64	0.42	0.42	0.38	0.42	0.70	0.83		0.76	0.68	0.73	0.74
Denomenator		1.01	1.12	1.10	1.16					1.08	1.09	1.10
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety		0.48	0.41	0.50	0.49					0.55	0.54	0.54

Minimum margin of safety is 0.22 at station 0.30 degree 90.00
Maximum margin of safety is 0.92 at station 6.00 degree 0.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{1.50 \times \text{erosion} + 1.50 \times \text{adj char}^{*}} - 1$$

Table D-XI. 360T025A Fixed Housing Assembly Char and Erosion Data

Angular Location	Stations										
0 degrees	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.75
Measured Erosion	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Measured Char	1.11	0.98	0.94	0.89	0.92	0.91	0.86	0.90	0.82	0.74	
Adjusted Char *	0.89	0.78	0.75	0.71	0.74	0.73	0.69	0.72	0.66	0.59	
Denomenator	1.25	1.06	0.94	0.89	0.92	0.91	0.86	0.90	0.82	0.74	
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.05	0.96	0.94	1.05	0.99	1.01	1.13	1.04	1.24	2.28	
90 degrees											
Measured Erosion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Measured Char	1.05	0.95	0.89	0.92	0.92	0.89	0.91	0.92	0.84	0.73	1.89
Adjusted Char *	0.84	0.76	0.71	0.74	0.74	0.71	0.73	0.74	0.67	0.58	1.51
Denomenator	1.05	0.95	0.89	0.92	0.92	0.89	0.91	0.92	0.84	0.73	
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.63	1.19	1.05	0.99	0.99	1.06	1.01	0.99	1.19	2.32	
180 degrees											
Measured Erosion	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Measured Char	1.22	1.01	1.06	1.07	1.10	1.14	1.09	1.10			
Adjusted Char *	0.98	0.81	0.85	0.86	0.88	0.91	0.87	0.88			
Denomenator	1.26	1.01	1.06	1.07	1.10	1.14	1.09	1.10			
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.02	1.06	0.72	0.71	0.66	0.61	0.68	0.67			
270 degrees											
Measured Erosion	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Measured Char	1.18	1.14	1.04	1.01	1.03	1.02	0.96	1.01	0.82	0.77	1.70
Adjusted Char *	0.94	0.91	0.83	0.81	0.82	0.82	0.77	0.81	0.66	0.62	1.36
Denomenator	1.20	1.14	1.04	1.01	1.03	1.02	0.96	1.01	0.82	0.77	
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.17	0.83	0.75	0.81	0.78	0.80	0.91	0.82	1.24	2.15	

Minimum margin of safety is 0.61 at station 5.00 degree 180.00
Maximum margin of safety is 2.63 at station 0.00 degree 90.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table D-XII. 360T025B Fixed Housing Assembly Char and Erosion Data

Angular Location	Stations										
0 degrees	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.75
Measured Erosion	0.04	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00		
Measured Char	1.09	1.08	1.01	0.96	0.95	1.01	1.03	1.02	0.93	0.72	1.69
Adjusted Char *	0.87	0.86	0.81	0.77	0.76	0.81	0.82	0.82	0.74	0.58	1.35
Denomenator	1.17	1.08	1.01	0.96	0.95	1.01	1.05	1.02	0.93		
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.25	0.93	0.81	0.90	0.93	0.81	0.74	0.80	0.97		
90 degrees											
Measured Erosion	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Measured Char	0.98	1.00	0.90	0.89	0.87	0.83	0.84	0.86	0.79	0.69	1.75
Adjusted Char *	0.78	0.80	0.72	0.71	0.70	0.66	0.67	0.69	0.63	0.55	1.40
Denomenator	1.02	1.00	0.90	0.89	0.87	0.83	0.84	0.86	0.79	0.69	
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.73	1.08	1.03	1.05	1.10	1.21	1.18	1.13	1.32	2.52	
180 degrees											
Measured Erosion	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Measured Char	0.98	0.91	0.83	0.90	0.89	0.83	0.81	0.81	0.74	0.65	1.84
Adjusted Char *	0.78	0.73	0.66	0.72	0.71	0.66	0.65	0.65	0.59	0.52	1.47
Denomenator	1.08	0.97	0.83	0.90	0.89	0.83	0.81	0.81	0.74		
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.52	1.15	1.20	1.03	1.06	1.21	1.26	1.26	1.48		
270 degrees											
Measured Erosion	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Measured Char	1.09	1.02	0.87	0.92	0.94	0.98	0.94	0.89	0.78	0.71	1.73
Adjusted Char *	0.87	0.82	0.70	0.74	0.75	0.78	0.75	0.71	0.62	0.57	1.38
Denomenator	1.17	1.12	0.87	0.92	0.94	0.98	0.94	0.89	0.78	0.71	
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.25	0.86	1.10	0.99	0.95	0.87	0.95	1.06	1.35	2.42	

Minimum margin of safety is 0.74 at station 6.00 degree 0.00
Maximum margin of safety is 2.73 at station 0.00 degree 90.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$